

THURSDAY, MAY 28, 1874

## THE AFRICAN ECLIPSE OF 1874

IT is often said that Science is a thing of slow growth, and it must indeed be confessed that if one turns aside from the advancement of Science as a whole to the advance of any one particular branch of it, the statement is too true. Over and over again one gets instances in which crucial experiments suggested by previous work are separated by decades or even by centuries. One cause to which this slow march is undoubtedly to be attributed is the apathy of men of Science themselves. To any science in which they do not themselves excel, and especially to any newly-opened-up branch of their own technic, the attitude of many men, and especially of *official* men, of Science, is not merely one of passive resistance; it is the attitude of the Schoolmen in the time of Galileo over again. We grant that these cramped minds are fortunately in a minority, but the minority is often a powerful one, for the reason, among others, that it is composed of men as a rule advanced in years, far removed therefore from the sympathies, unselfishness, receptivity, and unbounded horizon of youth.

It is a good sign of the times, therefore, when we find a scientific official large-minded enough, and with genius enough, to help on with his whole heart new studies as well as the old; and from this point of view we are especially anxious to draw attention to the fact not only that the total eclipse of April 16 of this year has been admirably observed, but that it has been observed by the Astronomer Royal of the Cape, Mr. Stone, himself, who has thus increased the debt of gratitude which both the mechanical and the physical sides of astronomy owe to him, careless, we doubt not, of the opinion held by a very high authority here in England that the spectroscope—the instrument he employed—is not an astronomical, nay, is not even an optical, instrument!

The line of totality of the eclipse in question struck land near Port Nolloth, on the west coast of Cape Colony, somewhere about 250 miles from Cape Town, and passed over the southern extremity of Africa in a curved line with the convexity turned towards the north, ending at sunset about half way across. There were three points whence the totality might be observed: Port Nolloth on the coast, O'okiep at the opposite extreme inward, a hundred miles away; and Klipfontein, about half way between. The last-mentioned spot was very fortunately the one selected by Mr. Stone. It is known locally as the "Cottage," forming the country or picnicing residence of Mr. Hall, an engineer, and on the brow of a hill rising at least some 2,000 ft. above the level of the sea. On the day of the eclipse down at Port Nolloth there was a cloud through which, as at Port Elizabeth and Graham's Town, the phenomena of the eclipse were all but utterly invisible. Up at Klipfontein the weather and the sky were all that could be desired.

Although full particulars of Mr. Stone's observations have not been received, the *Cape Argus* of April 25, a copy of which has been forwarded to us, contains extracts from private letters received from Mr. Stone, which place us *au courant* with the main points of the observations. The most complete account is as follows:—

"I observed the eclipse from Klipfontein. The day was most favourable, not a cloud being visible. The sight with the naked eye during the few moments I could spare from my work was grand and impressive beyond conception. The eclipse, however, appeared to me to differ a good deal from those lately observed.

"The rose-coloured flames extended very nearly around the moon, although of course of unequal heights at different parts. The corona appeared much less complicated. I saw no outlying brushes, and I should without hesitation express an opinion that all the corona I saw was of the same character throughout and belonged to the sun. The less complication of the corona may, however, have been connected with the purity of the atmosphere and the absence of clouds. I used a four-inch telescope lent me by Mr. H. Solomon. My spectroscope was one of two dense flint glass of 60°. The slit was opened as wide as could allow of a clear sight of Fraunhofer's lines. This was done to insure my being able to see the spectrum of the corona, which was expected to have been very faint. During the partial eclipse I examined most carefully the spectrum near the moon's limb, and away from the limb, to see if any fresh lines could be seen near the moon's limb. None appeared, and consequently there cannot be any medium capable of producing sensible absorption of light around the moon. As the totality drew near, the portion of the sun's disc uncovered was kept half way across the slit. At the instant of the totality the whole field appeared full of bright lines. I believe that all the principal Fraunhofer lines were reversed, and seen as bright lines. One of these lines I am certain was the red line B, but no sooner had I begun to count the lines than the spectrum changed into that of hydrogen gas. This spectrum being well known as that of the rose-coloured flames, I did not care to spend the few moments available upon it; but just glancing at the eclipse to see the brightness of the corona, I turned the telescope upon a bright portion of this beyond the rose-coloured light. The spectrum was much fainter than that of the rose-coloured flames, but there was an ordinary spectrum of some brightness, and across this I feel certain Fraunhofer's lines were still visible, although seen with some difficulty on account of the faintness of the general spectrum. There was also a discontinuous spectrum near the green of one very bright line, and two very faint lines of less refrangibility. I then turned the telescope of the spectroscope over the whole spectrum, from the red to the extreme violet, but I could see no other bright lines than those near the green. My time was now nearly run out, and I turned the telescope again upon the brightest of the lines, and brought the wire of the micrometers to fix its position. The telescope remained untouched until after the totality, when the micrometer was read and the position of the line referred to the Fraunhofer's line near it. This bright line appears to agree in position with the one observed by Young. I am satisfied with the results obtained, considering the instrumental means at my disposal. I have made magnetical observations at three stations, and hope yet to reach the Orange River for the same object. Mr. Carson and Mr. Hall have been kind to an extent that I could never have expected, and have thrown all manner of facilities in our way."

It will be seen that the results obtained by Mr. Stone confirm in an important manner several observations made on the eclipses of 1869, 1870, and 1871. The position of the coronal line 1474 scarcely required confirmation, but the two less refrangible coronal lines observed by Pogson in 1868 have been again seen. The coronal atmosphere was apparently, as might have been expected at this period of minimum sun-spots, smaller than in 1871, while the dryness of the air reduced the atmospheric

corona to a minimum. The spectrum of the reversing layer was again seen, thus confirming Young's and Pye's observation of 1870, and the hydrogen lines were seen high up, as in 1870 and 1871. The most important observation, perhaps, made by Mr. Stone is that referring to visibility of the Fraunhofer lines in the spectrum of the coronal atmosphere, showing thereby that that reflects the light of the photosphere.

In a letter to Mr. Solomon, written the day after the eclipse, Mr. Stone states on this point :—"The corona presented a spectrum of a mixed character. I have a strong opinion, amounting almost to certainty, that traces of Fraunhofer's lines were visible, but very difficult to observe, on account of the faintness of the spectrum. The other part of the spectrum of the corona was discontinuous, consisting of three bright lines."

The fact that Mr. Stone has been fortunate both in his weather and in his observations, makes us regret all the more that, the observatory station being so accessible, more efforts were not made in other directions, especially in the direction of photography. A series of photographs taken during the totality, which lasted over  $3\frac{1}{2}$  minutes, would have been a precious boon to Science, as the coronal condition of the sun at the periods of maximum and minimum sun-spots could then have been compared. In solar physics, however, we must at present be thankful for small mercies. We willingly agree that a Transit of Venus is a phenomenon to be observed at all cost, but we also affirm that a total eclipse of the sun is, in the present state of knowledge, a phenomenon not second in importance, and we trust that our scientific leaders will not forget that there is a very favourable recurrence of the phenomenon next year.

We are sorry to see that there is a chance of Mr. Stone being left to defray, out of his own pocket, the expenses of an important series of observations, undertaken on his Eclipse journey, on terrestrial magnetism. The *Cape Argus* properly points out that they should be defrayed out of Colonial funds. They are a contribution to Colonial knowledge, and we cannot doubt that the Colonial Government will readily place on the estimates the amount required to meet the cost of transport, which is all that is asked. Mr. Stone gives his own invaluable services and scientific skill without charge; the cost of his journey, so far as the eclipse is concerned, goes to Imperial account; and all that is asked from the Colony is his expenditure on additional journeys, viz. as far as the Orange River, for the magnetic observations referred to. We were very much surprised to hear that any hesitation should have been shown by Government in giving their sanction to the application when first made, and are almost still more surprised to find that it has not been formally acceded to since then. We admire economy, but do not admire parsimony; and we are perfectly certain that no sort of vote would be passed more heartily and unanimously by Parliament than that for the paltry amount of some sixty or seventy pounds sterling required to defray the expenses of these magnetic observations.

The same number of the *Cape Argus* gives us some information also as to the effect of the eclipse upon the natives. A digger at the diamond-fields told his natives that if they did not find a big stone that day they would see something in the firmament that would frighten

them. Just as the darkness was commencing a Kafir brought a 45-carat diamond that had been found a few hours previously. In Natal the Zulus stopped work when the eclipse began, and resumed when it was over, demanding two days' wages, the eclipse, in their opinion, having been a short night. The general effect on the natives at the diamond-fields is thus described in a local paper :—"The natives rushed out of their claims horror-stricken, and said that the sun was dying. The grandest living tableau ever seen was the great gathering of horror-stricken natives on the Colesberg Kopje, watching, with fearfully rounded and glaring eyes, mouth open and fingers pointed at what they believed to be the dying moments of the Almighty luminary whose majesty is the only God they know. The effect of the eclipse on the imagination of the natives, as depicted in their countenances, is described as terrible. They grouped together upon the heights of the Kopje and on the top of Mount Ararat, silent and awe-stricken. The natives knew nothing of the meaning of the ghastly light that preceded the darkness; gloom came upon their labours silently as a thief in the night, and it was not until the whole of the mines presented a sulphureous appearance that they left their work. When they did leave it they left it with a rush, crying one to the other, 'The sun is dying.'"

#### FOOD AND DIETETICS

*A Treatise on Food and Dietetics.* By F. W. Pavy, M.D., F.R.S. (J. and A. Churchill.)

THE want of a scientific work on Food and Dietetics has been much felt for some time. Experiments in various directions, both physiological and pathological, have been long accumulating, and have much needed arrangement and satisfactory condensation. Dr. Pavy has supplied the deficiency, and in the work before us gives an excellent account of all the most important observations which have any bearing on the subjects he discusses, tempered by the results of his own extended and judicious experience.

Our knowledge of foods in the chemical, zoological, and botanical point of view, that is as far as composition and derivation are concerned, is considerably in advance of our acquaintance with the true physiological bearing of the facts; and in this section of the subject Dr. Pavy does not attempt to do more than give the well-known analyses and descriptions of previous workers. His object, in the portion of the book devoted to the alimentary principles and the principles of dietetics, is to show how the tendency of modern experiment is to modify and almost subvert the ingenious theories of Liebig as to the functions of the different constituents of our customary diets.

After some introductory remarks on the dynamical relations of food, in which a simple explanation is given of the results obtained by Grove, Mayer, and Joule, as far as they affect the physiology of alimentary principles, the constituent elements of food are discussed both theoretically and practically. Physiologically the separation of the ingesta into "food" and "drink" is shown to be unsuitable. "The two material factors of life are food and air; and food may be considered as comprising that which contributes to the growth and nutrition of the body,